

**Armak**

EPA Establishment No. 9922-11-01 and 9922-11-02  
 EPA Registration No. 9922-19

Bulletin 8-1-19

**DUOMEEN C**

Bioicide for Use in Formulating Disinfectants,  
 Sanitizers and Algaecides

**INTRODUCTION**

Duomeen C is defined as 1-(alkyl-amino)-3-amino-propane and may be represented by the structure shown below where R is the alkyl groups derived from coconut oil fatty acids.

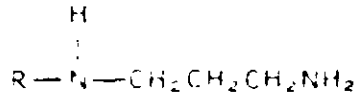


Table 1. Duomeen C Composition

Active Ingredients			
1-(alkyl*-amino)-3-aminopropane		100%	
(*alkyl groups as derived from coconut oil fatty acids)			
Inert Ingredients		none	
Specifications			
Color, Gardner		12 max	
Iodine Value		15.0 max	
Total Amine Number		387 min	
Moisture		1.0% max	
Neutralization Equivalent		145 max	

Table 2. Typical Properties of Duomeen C

Carbon Number (C <sub>n</sub> )	
Octyl (C <sub>8</sub> )	6
Decyl (C <sub>10</sub> )	7
Dodecyl (C <sub>12</sub> )	11
Tetradecyl (C <sub>14</sub> )	19
Hexadecyl (C <sub>16</sub> )	9
Octadecyl (C <sub>18</sub> )	2
Octadecenyl (C <sub>18</sub> ) and/or Octadecadienyl (C <sub>18</sub> )	6
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Form at 25°C	Liquid
Melting Range	-12-15°C
Specific Gravity at 25°C	~0.836
Flash Point, COC	295°F
Solubility in Water at 20°C	Insoluble

#### SOLUBILITY

Duomeen C is insoluble (<0.5% soluble) in water at ambient temperatures but disperses in water at 90-100°C. Reaction with hydrochloric, acetic or other mono-basic acids renders the diamine more water soluble but reduces its solubility in organic solvents. Duomeen C is soluble (>5%) in 95% isopropanol, acetone, ether, ethylene dichloride, carbon tetrachloride, methyl isobutyl ketone, ethyl acetate, benzene, VM&P naphtha, and mineral oil at 25°C.

#### TOXICITY

Duomeen C has an acute oral LD<sub>50</sub> in rats of 147.5 mg/kg of body weight and an acute dermal LD<sub>50</sub> in rabbits of 2000 mg/kg of body weight. It is corrosive to skin and eyes. See section of PRECAUTIONS for treatment and related handling information.

#### MICROBIOLOGICAL ACTIVITY

In tests against both gram-negative and gram-positive species (Table 3), Duomeen C was bacteriostatic at 100 ppm or less. It was effective against additional bacterial species at concentrations as low as 9 ppm. Duomeen C is also fungistatic at 100 ppm or less (Table 4) and shows efficacy against selected species at concentrations as low as 2 ppm. For control of algae, Duomeen C is an effective algistatic agent at 3 ppm or less (Table 5).

Table 3. Bacteriostatic Activity of Duomeen<sup>®</sup> C

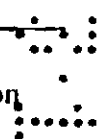
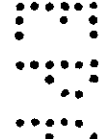
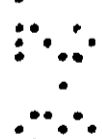
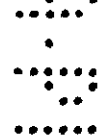






	Species	Effective Concentration
gram-negative	<u>Escherichia coli</u>	30 ppm
	<u>Pseudomonas fluorescens</u>	30 ppm*
gram-positive	<u>Bacillus subtilis</u>	30 ppm
	<u>Staphylococcus aureus</u>	100 ppm

\*Additional tests indicate bacteriostasis up to 48 hr at 2.5 ppm.

Table 4. Fungistatic Activity of Duomeen<sup>®</sup> C

Species	Effective Concentration
<u>Aspergillus niger</u>	100 ppm
<u>Chaetomium globosum</u>	30 ppm
<u>Myrothecium verrucaria</u>	100 ppm
<u>Trichoderma viride</u>	100 ppm

Table 5. Algistatic Activity of Duomeen<sup>®</sup> C

	Species	Effective Concentration		
green	<u>Chlorella vulgaris</u>	3 ppm		
	<u>Stigeoclonium species</u>	1 ppm		
blue-green	<u>Anabaena cylindrica</u>	0.3 ppm		
	<u>Oscillatoria tennis</u>	0.3 ppm		

## DUOMEEN C IN PETROLEUM RECOVERY

Bactericides and bacteriostats are added to water-injection systems to control a variety of microorganisms. Duomeen C has been tested against several species in accordance with the bacteriostatic test developed by the American Petroleum Institute. It is an effective bacteriostat for this application at concentrations of 25 ppm or less (Table 6).

Table 6. API Bacteriostatic Activity of Duomeen C

Species	Period of Stasis	Effective Concentration
<u>Desulfovibrio desulfuricans</u>	28 days*	25 ppm
<u>Pseudomonas fluorescens</u>	24 hours	20 ppm
	96 hours	20 ppm
<u>Bacillus cereus</u>	24 hours	5 ppm
	96 hours	5 ppm

\*Effective to 5 days at 2.5 ppm, 8 days at 5 ppm, and 21 days at 10 ppm.

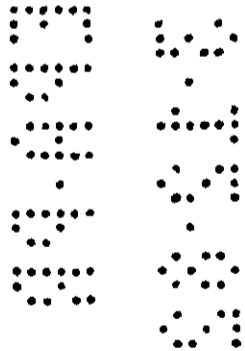


Table 7. Recommended Dilutions of Duomeen C

Duomeen C is 100% active. A 10% solution may be prepared by dispersing 1 gallon of Duomeen C in 9 gallons of a suitable solvent such as isopropanol. Duomeen C is not readily soluble in water but its acid salts (e.g., Duomeen C acetate) are. (See section of FORMULATIONS.)

Application	Recommended Use Dilution of Active (Approximate)	Preparation from Duomeen C (100% Active)*	Preparation from 10% Solution
Air Conditioning Systems Cooling Tower Waters	1:200,000 (5 ppm)	Add 6.4 oz to 10,000 gal water	Add 64 oz (2 qt) to 10,000 gal water
Secondary Oil Recovery	1:40,000 (25 ppm)	Add 1 qt to 10,000 gal water	Add 10 qt to 10,000 gal water
	1:50,000 (20 ppm)	Add 1 qt to 12,500 gal water	Add 10 qt to 12,500 gal water
	1:200,000 (5 ppm)	Add 6.4 oz to 10,000 gal water	Add 64 oz (2 qt) to 10,000 gal water
	1:400,000 (2.5 ppm)	Add 3.2 oz to 10,000 gal water	Add 32 oz (1 qt) to 10,000 gal water

\*Addition of 5% of glacial acetic acid, based on the weight of amine, will enhance water solubility of Duomeen C.

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**SUGGESTED FORMULATIONS**

Duomeen C is especially recommended for use in cooling tower waters and petroleum downhole applications. Because of its limited solubility in water, ArmaK has developed a number of suggested formulations to be used as a starting point in developing suitable biocides for specific applications. These may be further diluted at time of use to provide specific effective concentrations.

AQUEOUS FORMULATIONS

Weight Percent\*

Duomeen C	17.0	12.0	12.0
glacial acetic acid	—	5.0	5.0
isopropanol	40.0	20.0	20.0
n-butanol	—	—	10.0
deionized water	43.0	63.0	53.0

Physical Properties

Temperature, °F

cloud point	34	40	55
pour point	5	10	5
flash point, Pensky-Martens	66	64	75

\*Duomeen C based on maximum neutralization equivalent or amine number.

OIL-BASED FORMULATIONS

Weight Percent\*

Duomeen C	17.0	17.0
n-butanol	10.0	10.0
heavy aromatic naphtha (HAN)	73.0	—
mineral spirits	—	73.0

Physical Properties

Temperature, °F

cloud point	30	34
pour point	-30	10
flash point, Pensky-Martens	80	77

\*Based on Duomeen C as supplied.

PACKAGING

Duomeen C is shipped in unlined 55-gallon steel drums or bulk in tank trucks or tank cars. See bulletin titles Storage and Handling of Armeen and Duomeen Amines for detailed information on bulk and drum storage and handling of Duomeen C.

SAMPLES AND SERVICE

Samples of Duomeen C will be sent to you on request. To obtain samples, technical service, prices or additional information, write or phone your nearest Aramak Industrial Chemicals Division representative.

PRECAUTIONARY STATEMENTS

HAZARD TO HUMANS AND DOMESTIC ANIMALS

KEEP OUT OF REACH OF CHILDREN

DANGER. Corrosive. Causes eye and skin damage. Do not get in eyes, on skin, or on clothing. Wear goggles or face shield and rubber gloves when handling. Harmful or fatal if swallowed. Avoid contamination of food.

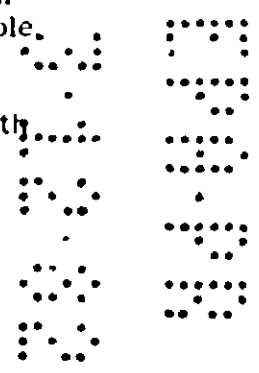
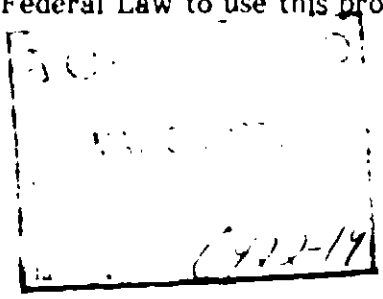
ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish. Do not discharge into lakes, streams, ponds or public waters unless in accordance with an NPDES permit. Do not apply in marine, and/or estuarine oil fields. For guidance contact your Regional Office of the EPA.

DIRECTIONS FOR USE

For formulating use only. Duomeen C may be used as an active ingredient in a pesticide formulation, but the formulator must register his end-use product with the EPA as a pesticide. Such registration may require the submission of additional environmental and health impact data, as well as field efficacy data. The formulator, at his own time and expense, must obtain separate registration to sell Duomeen C in any formulated product, even if the formulation is a simple dilution with water or other solvents.

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.



#### STATEMENT OF PRACTICAL TREATMENT

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. For eyes, call a physician. Remove and wash contaminated clothing before reuse.

If swallowed, drink promptly a large quantity of milk, egg whites, gelatin solution or if these are not available, drink large quantities of water. Avoid alcohol. Call a physician immediately.

#### NOTE TO PHYSICIAN

Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsion may be needed.

#### STORAGE AND HANDLING

Store drums in a sheltered area away from heat and cold. Use approved equipment for transport of drums to avoid puncturing or rupturing of container. Do not use air pressure to transfer.

#### DISPOSAL

DO NOT REUSE DRUM. Since emptied containers retain residues, all labeled hazard precautions must be observed. Return to drum reconditioner with all precautionary labels intact or destroy the drum by perforating or crushing and burying in a safe place away from water supplies. OPEN DUMPING IS PROHIBITED.

#### SPILLAGE

Clean up spills immediately. Small spills can be cleaned up by spreading floor-cleaning compound or other suitable absorbent material on the spill and sweeping up the residue. Larger spills should be flushed to a collection basin for disposal. Clean area well with detergent and water.

#### FIRE

Fire can be contained with water fog, carbon dioxide, sand, or dry chemicals.

NOTICE: The technical information and suggestions for use made herein are based on Armak's research and experience and are believed to be reliable, but such information and suggestions do not constitute a warranty, and no patent liability can be assumed. Since Armak has no control over the conditions under which this product is transported, stored, handled, used or applied, it is Armak's intent that its liability on any basis be limited to the price of the product used.

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